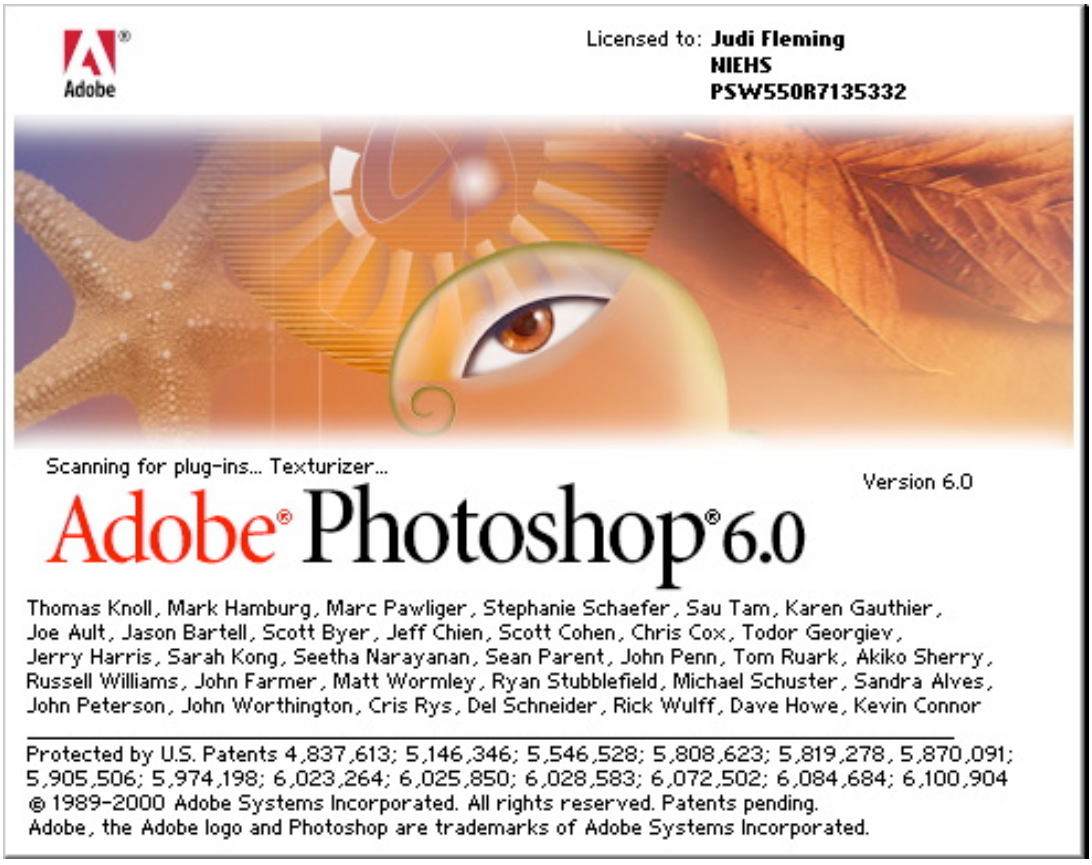
PhotoShop for Scientists



Revised: May 29, 2002
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Before You Begin:

Most people want to dive right into computerized graphics with the same ease of picking up a paintbrush and going to work on a canvas. At first it seems like it will be fairly simple, but anyone who has tried to create a masterpiece the very first time they try their hand at painting have found out that there is more to painting that putting color on canvas.

When dealing with graphics created with the assistance of a computer you have several questions to ask yourself **before** you begin adjusting the first pixel on the screen.

1. ***What type of image are you starting with?***
2. ***What will you be using this image for?***
3. ***What is the final product of this work?***
4. ***Which software do I have to use?***
5. ***Will I need to use more than one software package to complete the production of the material?***
6. ***What kind of quality is necessary?***
7. ***What are the abilities of the output devices you will be using?***

Without this information, you may find yourself with graphics file sizes that are too large for some software packages, file types that can't be imported into another software package, or worse yet, you may have files that cannot be printed to the devices of your choice.

Although you may create your images in one program, you may find that another has some special features to adjust your image and then you may move on to a presentation software package and import the images into that software. You'll find that some combinations work very well and that others just don't work at all. If you have a firm idea of what you will use the final product images for **before** you begin, then you will save yourself considerable headaches while creating them.

What Resources are Available?

There are a variety of resources available here at NIEHS. They range from full-service graphics where someone will take your concept and pencil drawings and make them into beautifully produced posters, photographs, banners, transparencies, web graphics, 35mm slides and much more.

On the other end of the scale, there are resources available to you so that you could make all of your own images from scratch and produce a more limited range of media, or turn them over to be produced for you once you've finalized them yourself.

Arts and Photography

Here is the full-service shop you've been looking for! If you don't have the artistic talent called for on the graphics job you are looking for, they do have a group of graphic artists that produce the high quality artwork you've seen around the Institute.

Scanners and Cameras (You should call ahead for availability):

1. If you've got something you need to scan yourself, they do have three flatbed scanners available for public use during them regular office hours.

2. Arts and Photography also has a digital camera available for sign-out.

Check out their web page for additional services:

http://www.niehs.nih.gov/ap/home.htm

or call or visit:

NIEHS Arts & Photography

Location	Building 101 Room E-139
Hours of Operation	8:30 am - 5:00 pm
Phone	(919) 541-0922
Fax	(919) 541-0924
Mail Drop	E1-10

Public Machines:

There are several pieces of equipment available for all NIEHS employees 24 hours a day, seven days a week. We ask that you do NOT customize the software on these machines. They are all located in Building 101 on South Campus.

A261
Macintosh
Flatbed Scanner
35mm Slide Scanner
PC (Windows 95)
Color printer for paper and transparencies (hollis)
Color transparencies for PC ONLY (kanosh)

The public Macintosh is connected to both the flatbed scanner and the 35mm slide scanner. It has PhotoShop 6.0, Canvas, PowerPoint, Word, Excel, Transparency and GraphicConverter loaded on the computer for you to create and adjust graphics. Next to the machine are the instructions for uploading and downloading graphics to/from that computer to a server that you can access the files from a PC or a Mac.

If you are only interested in printing, we have an additional pair of printers available for public use in F-Module. There are no public machines available for use in that location, so you must send the print job to these printers from your own computer or from the public machines in A258.

F091
Color printer for paper and transparencies (windom)

If you do not know how to change your printer choice on your machine, see Appendix B or contact your Computer Support Person (CSP) for assistance.

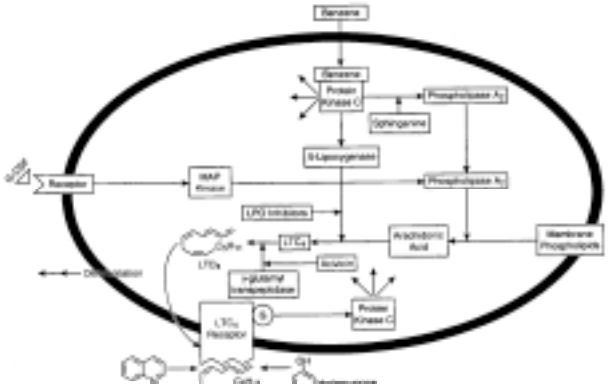
Using the Public Scanners

The most current instructions for doing the actually scanning for either a flat image or a 35mm slide are taped to the front of the machines with clear, step-by-step instructions. You will find both PhotoShop's **Import** option of Scan Wizard for flat graphic images, SprintScan for 35 mm slides. If you are scanning text for use as text, you will use another software package named OmniPage Pro for this.

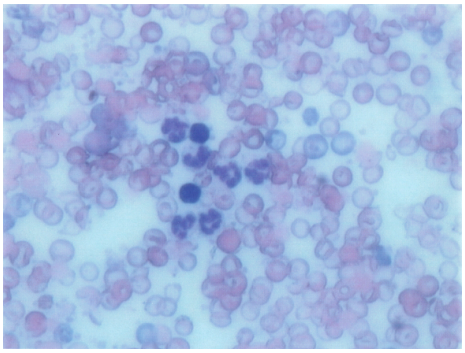
You should distinguish between four different basic scanning choices:

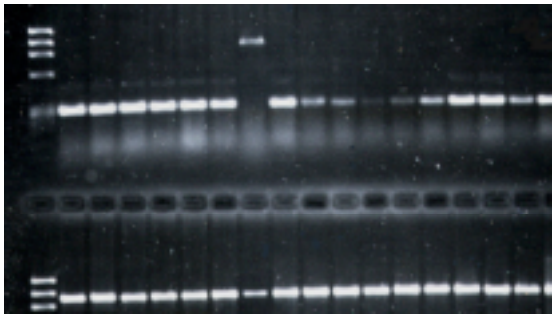
Using PhotoShop:

1. **Line Art:** Black and white line drawing/illustration or pencil drawing
   Scan at: 300 dpi and appropriate size for final image
   Save as: the file type you will need for the application (.gif, .jpg, .pict, .tiff)



2. **Photographs/Illustrations:** Black and white and color photos and illustrations, images from articles or books (this includes gels, illustrations from manuals, cartoons, microscope pictures, etc.)
   Scan at: 100-200 dpi and appropriate size for final image
   Save as: the file type you will need for the application (.gif, .jpg, .pict, .tiff)





3. **35mm Slides:** Black and white or color slides

Scan at: 150 dpi and appropriate size for final image
Save as: the file type you will need for the application (.gif, .jpg, .pict, .tiff)

Using OmniPage Pro:

OCR: Text to be used as text (magazine articles, book chapters, memos). Click on **Auto** and allow it to scan using the default settings.
Save as: the file type for the application you are going to use the text (Word, WordPerfect) in or as TEXT ONLY. (The default file type is a Carare document.)

NOTE: This software only recognizes text and ***not*** graphics. If you also need the pictures from a page that contains text, you should scan them separately (as indicated above) using PhotoShop.

Also note that text scanning is only 98% accurate and you should check the words once you have it in the word-processing package you will be using. Start with a simple spell check and then read the document to find any other mistakes such as "head" vs. "heed" that can occur.

Professionally scanned images are generally made after careful checking of the scanner's actual listed ability. If you know these numbers for your scanner, use the right hand-column to set the dots per inch on the scanning software. This information is provided for those doing more than just the basics with scanning.

Scanner's Listed DPI Output	Scanner's Listed Line Screen	Your DPI Scanning Setting
300	53-60	120
600	71-85	170
1200/1270	65-128	256
2400/2540	90-150, 133	266
3386/3600	150-300	600

Flat Images

It is very important to decide what you will be using your scanned images for before you start scanning. Will you be scanning text or graphic images such as line drawings, photographs or images? Will they be used for a web page? Or perhaps they will be used in a 35mm slide or an overhead transparency. You may even decide that they will be used as illustrations in your Word document.

If you are going to use the scanned item as an image or graphic, use these steps:

1. Lift the scanner cover and place the item face down with the top towards you.
2. From the Dock (right side or bottom of screen), click on the **Adobe PhotoShop** icon 
3. From the Adobe PhotoShop menu items, choose:

   File

- **Import**
  - **Epson Scanner Perfection 3200**

4. When **Epson window** opens, press the **Preview** button.

5. Use your cursor to click and drag an area around your image or adjust the dotted box (if already present) to enclose the portion of the image you would like to scan.

6. Adjust the level of scan (dpi) to the appropriate level that you will need for your presentation:

   - No more than **200 dpi** and **millions of colors** for photographs and illustrations to be used in Word, Excel or PowerPoint.
   - Exactly **300 dpi** and **line art** for black and white/pencil drawings to be used in Word, Excel or PowerPoint
   - No more than **72 dpi** and **256 colors** for use in web pages
   - Exactly **75 dpi** for images to be used with NIH Image

7. Adjust the size of your image by changing the default of **100%** to the appropriate size. After you have selected the image in step 6, the Settings window shows the actual size of the image you will be scanning. If this is NOT the size you will need to use in your final production, adjust the percentage until it is the correct size.

NOTE: You should never adjust the size of an image once it is imported into software packages such as Word, Excel or PowerPoint as it makes the file sizes exponentially larger and cause a pixilization or "jaggy" effect in the image.

8. Click on **Scan**.

9. Save the image in the type needed and onto the disk or server of your choice.

   1. use .TIF, .JPG or .EPS (MAC) or .JPG, .TIF, or WMF (PC) for use in Word, Excel or PowerPoint documents
   2. use **only** .JPG or .GIF for use in web pages

10. Remove your original and turn off the scanner.

NOTE: If you are scanning some photographs, you may notice that a pink or purple hue has been added to the image. To correct this, select **Image**, **Adjust**, **Auto Levels** from the PhotoShop menu items.

SCANNING TEXT:

<u>If you are going to use the scanned item as text, then follow these steps:</u>

1. Turn on the scanner. (The button is on the back right-hand corner.)

2. Place the item face down with the top towards you.

3. From the Apple menu items (top left corner), open **OmniPage Professional**.

4. Click on the **Auto** button on the top left below the menu items. (If the toolbar with the Auto button is missing, choose View, Show Toolbar from the menu items first.) Allow the image to scan, be recognized as groups and be placed into a document. Repeat this step for more than one page and OmniPage will automatically place the pages in order of scan on one document.

5. Save your document to a disk or server of your choice as MS Word 5.0 or WordPerfect (instead of the default of Carare) and give it a name.

6. Remove your original and turn off the scanner.

35MM Slides or Negatives

1. Turn on the Epson Scanner

2. Remove the cover on inside of lid 

3. Place the 35mm slide holder on the scanner glass and align it with the upper right hand corner. (An triangle marks the corner on the scanner) 

4. Insert the 35mm slides into the holder and close the lid. 

5. From the Dock (right side or bottom of screen), click on the **Adobe PhotoShop** icon. 

6. From the Adobe PhotoShop menu items, choose:

File
- **Import**
  - **Epson Scanner Perfection 3200**

7. When **Epson Scan Wizard** opens, press the **Preview** button.

8. Choose the film type: (transparency)

   a. Choose 24 bit color or grayscale.

   b. To change orientation, open the View pop-up menu and choose portrait or landscape

9. Choose the resolution value (dpi) you want. Note that the image size scans at actual size of 100% which gives you a **1" x .9"** image! Changing it to 600% will give you a 3" x 5" printed image instead.

10. Click the **Scan** button.

11. Save the image to the type you need to your disk or server.

12. Remove your original and turn off the scanner.

What Type of Image are You Starting With?

Many times we have a picture, drawing, 35mm slide or an illustration that we would like to put into a MS Word document or on a web page and need to scan. There are a dizzying number of things to take into consideration before you ever click on the scan button, so be sure you read through this information carefully.

Knowing what you have will determine how you will scan an item for use in your final product. For example:

1. If you are using a black and white photograph or gell (see example in Step 1on Page 4), you should not choose Black and White as the image type when scanning! There are subtle shades of lavender and blue in the image and for the best results, you should use 256 or millions of colors as appropriate.

2. If you have a plain black and white drawing or illustration, you should not choose black and white this time either--this is considered a line drawing and thus you should choose Line Art when scanning (see example in Step 1 on Page 4).

You can also start with things like ClipArt images from the web or purchase collections on CDs. Check out:

http://www.niehs.nih.gov/websmith/howto/graphics.htm

http://www.clip-art.com

http://www.clipartconnection.com/

http://directory.netscape.com/Computers/Graphics/Clip_Art

http://directory.netscape.com/Arts/Illustration/Stock_and_Clip_Art

Another way to acquire images is to do a screen capture. If you have a Macintosh, you'll need something like the Control Panel **Flash-It** installed or the program HyperSnap. A PC user can ask for **Snap-It** for their computer. Once you've captured the image, you can simply use the **Edit**, **Paste** command to place it into the document of your choice.

NOTE: This is NOT recommended for files that are going to be sent to or printed by Arts and Photography as their equipment does not read these images. If you are sending a document or slide presentation to them for printing, please save the image as the appropriate file type and use that software's Import option to enter the image. This means you will have to use an intermediary software package to save the image as the appropriate file type (.gif, .pict, .tiff, etc).

To avoid this problem, you can take advantage of PhotoShop's flexibility:

1. Do the screen capture.
2. Switch to PhotoShop and choose **File**, **New**. PhotoShop automatically knows how large the image is in your clipboard and will ask if you would like a new document with those same dimensions.
3. Click on **OK**.
4. Choose **Edit**, **Paste**.
5. Choose **Image**, **Flatten Image**.
6. Save the file as the appropriate type for your project and then import the image into the software necessary to complete your work.

What Will You Be Using This Image For?

Knowing what the final product(s) that use your images is one of the most important things when working with graphics. Scanning something for use in a poster session requires different settings/file types than scanning it for use exclusively on a web page. Below are some basic differences in final products.

Web Pages

Web page images can **only** be saved as .JPG or .GIF formats. If you have an image that will be used on a web page, use the following guidelines:

1. Scan at no more than **72 dpi**.
2. **256 colors** (to reduce the file size and image loading time).
3. The image should be saved in either **.JPG** or **.GIF** format only.

Why these limitations? These graphics are going to be viewed on a computer monitor. The highest resolution, even on the most expensive monitor is still only 72 dpi. If you are going to use the scan for print media as well, then you should scan at the higher resolution and save the file out for that. Create a copy of the file and reduce the dpi (PhotoShop: Image, Image Size, Resolution) and save as the appropriate file type.

You must also take into consideration the fact that some of the people who will view your web pages and their associated graphics will be accessing the internet via modem. Large graphics files on your web pages means slow loading. This can be especially frustrating if

you have several large image files on your page. You want to reduce the loading time of your page whenever possible. Stripping them down to the bare essentials is important for the users with slower connections.

Which of the two file formats should you use? For photographs, detailed and color images, use .jpg and for flat, more line drawing type of images use the .gif format.

Word, Excel or PowerPoint

If you have an image (a color OR black and white photograph, a picture from a book or an illustration of your own) that will be used in slide presentations or a word processing document, you should scan at no more than **200 dpi** and at **millions of colors** (even for black and white images of gels). The file should be saved as TIF, .JPG or .EPS (MAC) or .JPG, .TIF, or WMF (PC) type for use in PowerPoint, Word or Word Perfect or Excel.

1. Scan at no more than **200 dpi** (100 dpi will give you a smaller file without any noticeable loss of quality).

2. **Millions colors** (or 256 to reduce the file size when color isn't as important as the overall image).

3. The image should be saved as .TIF, .JPG or .EPS (MAC) or .JPG, .TIF, or WMF (PC) depending upon what you will be using this image for later.

The next question people usually have is "How do I get this file into my document?" On all three programs, you will select **Insert**, **Picture**, **From File** and show it where you have stored the image. This method works the best on PowerPoint.

With graphics that will be used in Excel and Word do the following steps:

1. Open the Drawing Tools toolbar either by clicking on **View**, **Toolbars**, **Drawing** or by pressing the Drawing Tools toolbar button:

2. Click, hold and drag your mouse to draw a box that is about the same size as the image you will be inserting.

3. From the menu items, select **Insert**, **Picture**, **From File**. You now have an image inside of a text box frame. To move this image around, you will need to click, hold and drag using the outside text box frame and not the inside picture file, for example:

4. Double-click on the border of the text box frame to get the text box formatting window and select the appropriate **Line Color** and **Wrapping** choice to suit your needs.

Although it is tempting to enlarge or reduce the image in any of these three software packages, **DON'T**. This degrades the image and increases the file size exponentially! All

image size changes should be made at the time of scanning or inside of the graphics software packages like PhotoShop, Freehand, Canvas or QuarkXPress.

NIH Image

If you would like to use the image to calculate an area using software like NIH Image scan at:

1. **75 dpi**
2. save as a **.TIFF** file.

If you have both PhotoShop and NIH Image on your computer, the Acquire command provides direct support for most scanners that have PhotoShop plug-ins. Three scanning modes are supported: 8-bit grayscale, 8-bit indexed color and 24-bit color. 24-bit color images are stored as a three-slice (red, green and blue) stacks and the RGB to 8-bit Color command is automatically called to generate an 8-bit color version of the image.

A list of scanners known to work with Image is included with the description of the Acquire command. The plug-in that comes with the La Cie Silver scanner is one that works particularly well with Image.

You need to be careful not to generate images that are too large for Image to handle. Image was optimized for the 640 x 480 (300K) images produced by frame grabber cards, whereas an 8 x 10 inch page scanned at 300 DPI is 2400 x 3000 pixels (7.2MB), much larger than Image was designed to handle. The following table gives suggested maximum scan areas for different scanning resolutions and monitor sizes. Image can handle scans somewhat larger than these, but you will probably run into problems if you greatly exceed these recommended sizes.

Monitor	75 DPI	150 DPI	300 DPI
14" (640x480)	8" x 6"	4" x 3"	2" x 1.5"
17" (832x624)	11" x 8"	5.5" x 4"	3" x 2"
20" (1152x870)	14" x 11"	7" x 5.5"	3.5" x 2.75"

Use the Preferences command to increase the size of the Undo and Clipboard buffers to 600K when working with scans of the size suggested for 17" monitors, and to 1000K for 20" monitors. Note that making the Undo and Clipboard buffers larger then necessary can require a lot of extra memory. For example, increasing the buffer sizes from 1000K to 1500K increases Image's memory requirements by 1MB.

You should probably stick to 75 DPI unless scanning small selections. 75 DPI also has the advantage of producing images that are near actual size when displayed or printed, since nominal screen and printer resolution on the Macintosh is 72 DPI.

Other Options:

Another option is to take some very specialized training to obtain 150 PhotoShop plug-ins that has been reviewed as useful or more useful than NIH image. More information on this can be found at: **http://members.aol.com/ipcourse/IPCourse.html**. This course is only offered once a year at NCSU and the cost is approximately $1,695 per student.

Common Mistakes

Taking a big high resolution scan and shrinking it to tiny size:
Files that you "click, hold and drag": to make smaller create 16 megabytes for a postage stamp--yow! Reduce resolution by sampling down in a graphics program or better yet re-scan at a lower resolution. Another option is to strip out the extra pixels by changing the image resolution in a graphics software package like PhotoShop (Image, Image Size).

Cropping a little piece of a big image in a page layout program:
The software (such as PageMaker or QuarkXPress) has to process that whole, big image then throw away what's outside the cropping window. Crop first in a graphics program (PhotoShop, FreeHand, Canvas, Illustrator), and bring what you need of the image into the page at the proper size.

Thinking that white or black borders don't count:
All white or black areas around your image creates data too. Crop the borders away while scanning to save the most time, or later in your graphics software.

Using a page layout program to rotate big images:
Most software packages like image data straight. Twisting all those pixels is risky, lengthy work. Rotate in a retouching program or rescan in the right orientation.

Scanning Line Art (all black and white images) as a grey scale because it has fancy shadow detail:
Scan your artwork at a higher Line Art resolution rather than grey scale. A 2 x 3 inch 150 dpi 8-bit grey scale is 2 megs worth of data compared to 600 k for a 2 x 3 inch 400 dpi 1-bit Line Art scan.

Line Art Scanning

Line Art scanning is best defined as simply transferring pen and ink style drawings, some simple clip art, and some pencil sketches into the computer system. Line Art has no shading nor color other than black. Line Art scanning is considered 1-bit scanning, that is the computer sees the image as either black or white.


Anti-Aliased 
"Jaggies"

Line Art scans, since they can only be black or white, do not have the luxury of anti-aliasing (a technique that makes smooth transitions between black and white by adding varying steps of grey), and therefore are prone to having jagged edges around curves when scanned at lower resolutions than the final output device. Therefore, you should not use Line Art style scanning to scan photographs or textured art unless you are attempting to achieve some special (read - often weird) effects.

Line Art should be scanned at as high a resolution as the final output device to eliminate the jaggie effect. In other words if you have original art that is 5x7 and you are going to output at 5x7 on a 1200 dpi imagesetter, ideally it should be scanned at 1200 dpi to achieve the best possible image. Note that if your original is larger than the final size, you should adjust your original scan resolution by the same ratio so as to not have more resolution than necessary.

On a personal note here, while the goal of matching original scan resolution with final output resolution is desirable, very few of your clients will be able to discern any difference between 600 dpi scans and 1200 dpi scans, especially when your final output will be printed on glossy paper stock. However, the difference in imaging time to your printer or imagesetter will be quite remarkable since you are dealing with *four times* as much data in a 1200 dpi scan.

One last thing worth mentioning here is tracing. The majority of line art that is scanned is usually some simple drawings or sketch used as a template for a more exact computer illustration. Using Corel Trace, Adobe Streamline, or the AutoTrace function in FreeHand, you can convert the line art scan into Encapsulated postscript (.EPS) and thus allow you to increase the image to any size with out the fear of the “jaggies” (of course, this is not a flawless step, you may well have to spend a considerable amount of time correcting for obscure autotracing errors).

A Note About Image Formats

There used to be a time when selecting a certain image format made a big difference in quality. In today's ever-improving world of graphics, the focus is more on choosing the right format for the application you will be using as your final design layout.

Color, Printed Quality and Preview

Colors are also another problem spot. You may love the colors you see on the screen, but when you print them out to a color printer and then to a dye sublimation printer, you'll find that you have three very distinct colors! This can be extremely frustrating. Keep in mind that most printing devices will print the images darker than what you see on your computer monitor.

Thus, one of the biggest "problems" people have when they first start doing scanning is the match of the color from what they see on the screen and what gets printed out. A computer monitor is seen in terms of the RGB color scale. The color of white is the presence of all colors (as in the rainbow you get when you split light through a prism) because it is light that is generating the color. So primary colors for a screen are Red-Green-Blue.

While in the world of printing, color is applied to a piece of paper and the colors are not generated by light, but by inks. Thus printers follow the CYMK or CYM color scale. This stands Cyan-Yellow-Magenta-Black or just Cyan-Yellow-Magenta, and the presence of all colors would be equal to black.

So you as a user are stuck on a computer that has one color standard and then you print to any media that uses another. Thus that perfect blue you see on the screen can never really be translated to a printed perfect blue, but it does get close.

NOTE: Finally, quality and clarity of the printed image may have very little correspondence to the image preview on your screen. In almost all instances, screen resolution is much lower than printer resolution. For instance, many screens have a resolution of only 72 dpi while a common printer resolution is 300 dpi (color printers usually start at 600 dpi). Therefore an image may look jaggy on the screen no matter how high a resolution that you scan it in, but it will print smoothly.

Problems with Color Tones when Scanning

At times it will appear that the picture you scanned shows up on the screen with a slight color cast to it. To correct for this (the light reflects off the image as it is scanned and creates the color change), you will do the following:

1. In PhotoShop choose
   Image
   - **Adjust**
     - **Autolevels**

2. Save your file.

Other Device Differences

Different scanning devices use different scales in scanning the images you are using. Some ask for the number in **dpi** (dots per inch), others are in **lpi** (lines per inch) and yet others are in **ppi** (pixels per inch).

If you are using standard scanners such as the one up in A258 on the Public Mac, you will be using dots per inch. Scan your images at the DPI appropriate for the type of output you desire. Scanning at higher resolutions will only increase file size and imaging time but not improve image quality. Below are the recommendations for files that will be sent to Arts and Photography for final output of your files:

100 DPI	Display Maker posters
200 DPI	35mm Slides Dye Sub Prints/Transparencies
300 DPI	Color Lasers Iris Prints Linotronic Prints

Color Modes

To make matters even more confusing, when you are saving your images in the file format of you choice, you also have options to select the color mode. **RGB** is a red-green-blue color mode. **CYMK** is a cyan-yellow-magenta-black color mode. **Grayscale** allows images to be saved in very fine distinctions in shades of gray.

Which is best? It all depends upon what you want as your final product. Always scan and save your images in the **color mode** appropriate for the type of output you desire.

RGB	35mm Slides Color Lasers Dye Sub Prints/Transparencies Display Maker posters
CMYK	Iris Prints
GRAYSCALE	Linotronic Prints

Which Software?

If you are really going to get into image creation and editing, you will use more than just PhotoShop, PowerPoint, Word and Excel. Each software package has its own strengths and weaknesses. In the world of graphics, there are specific software packages with specific purposes.

Some software is good for photo editing while others are designed to help the illustrator create brand new images. Working on a gell would best be done in PhotoShop, while creating a lab log would call for something like FreeHand or Canvas.

Here at NIEHS, we cannot afford to purchase site licenses for these very expensive pieces of software, so if you choose to use these please note their support levels from your Computer Support Person and for training at:

http://www.niehs.nih.gov/lsp/lspguide/l_ssoft.htm

You should also be warned that learning graphics software can not easily be compared to learning the standard Microsoft software packages you use here routinely. Each graphics software package has an extremely steep learning curve and once you learn one package, the information is rarely transferable in learning another one. Below you will find a list of the most common applications used for creating:

1. "object" or "vector-based" drawings
2. complex drawings and illustrations
3. drawings with EPS or PICT clipart

The latest versions, computer platforms and file formats that Arts and Photography support are listed for each application.

If an application or version you are using is not listed here, please check with Arts and Photography to see if we have software that is compatible.

APPLICATION	VERSION	PLATFORM	READABLE FILE FORMATS	
			Mac	PC
Canvas	5.0.3	Mac PC	EPSF GIF JPEG MacPaint PICT TIFF	BMP EPS GIF JPG PCT PDF PNG TIF WMF WPG
CorelDRAW	8.0	PC		
Freehand	8.0	Mac PC		
Freelance	2.1	PC		
Harvard Graphics	4.0	PC		
Illustrator	7.0	Mac PC		
MacDraw II MacDraw Pro	1.1v2 1.5v1	Mac		
Superpaint	3.0	Mac		

Which should you use? If you are doing a 35mm slide presentation or making overhead transparencies without any fancy graphics, then PowerPoint is a fine package for the text and simple graphics and word effects. If you are looking to do something more sophisticated, then perhaps you group/section/lab should look into purchasing something more robust. Currently many of the Computer Support Personnel and Arts and Photography people recommend Freehand for either the Mac or the PC platform.

Remember: You will most likely use more than one or two software packages to complete your total project. This is not unusual when working with graphic images and text.

Fixed Resolution Images

Fixed resolution images are made up of individual dots called pixels. When you decrease the size of a fixed resolution image, you actually decrease the size of each pixel and likewise, if you increase the size of a fixed resolution image, you are actually enlarging each individual pixel. Fixed resolution images have an optimum size for printing which varies from image to image. If you decrease its size too much, the image may lose clarity and if you increase the size of the image too much, you can create “jaggies” and the images may appear to be choppy.

Fixed resolution image formats include:

.TIFF
.TIF
.JPG
.JPEG

Vector Images

Vector images are made up of lines and points that make geometric shapes. With vector images, the computer is told to put a "pen" in a particular position and then draw a line or a curve a certain distance in a certain direction (or draw a line to a specific point). When you resize a vector graphic, you mathematically alter line or curve as opposed to enlarging pixels as with fixed resolution images. Vector images are sometimes called "device dependent" meaning that the resolution of the graphic is as good as the output device you use (printer, monitor, typesetter, etc.). You can stretch a vector image to any size without losing image quality. Vector file formulates include:

1. .WFM
2. .EPS

EPS vector images require a PostScrip or PostScript compatible printer.

What exactly is the difference between a PICT and a TIFF file?

For the most part they contain the same type data when it comes to bitmap information, that is each pixel in the image. But the PICT file specification (created by Apple and based on Quickdraw) can also contain vector data. Vector data is resolution independent. For example, instead of a series of pixels making up a line across an image in a bitmap, a vector line would be an x,y coordinate where the line starts and stops and then a value for its thickness and color.

As you can see the PICT file can be much more complex than a TIFF file and this is why Aldus along with Microsoft created the TIFF file specification. They needed a simple yet rich file type that could handle greyscale data from a scanned file and be exchanged between various machines and operating systems.

TIFF is the most widely supported bitmap file format to date. It is now capable of handling not only greyscale data but color data as well and even has the ability to store data in a compressed form (LZW and Packbits in the 5.0 spec, CCITT IV and V, and JPEG/M-JPEG in the 6.0 spec).

PICT currently has only one method for compressing a file, through the use of the Quicktime/Quickpress extension from Apple, this allows a PICT file to be stored as a JPEG compressed file and read by any application without conversion first.

Which format is best for a specific image (i.e. a simple B&W, a scaled-- image, a color image, etc.)? It depends entirely on your situation. Remember, that more pleasing it is -- the more memory and the slower your system will be in manipulating them. TIFF can be the best file format for all of these examples mentioned if you are using the real graphics packages like PhotoShop, FreeHand, Canvas and Quark. The basic TIFF file (5.0) can handle 1-bit, 4-bit, and 8-bit greyscale data, and can handle 8-bit, 16-bit, and 24-bit color data. The most common forms however are 1-bit and 8-bit greyscale, and 8-bit and 24-bit color. With the two basic forms of compression recognized in the TIFF spec you can successfully compress all of these types of images so that they take up less space in storage without worrying about using some secondary compression utility.

Using Your Image Once it is Scanned

Inserting Your Image into a Document

With many of the scanned images, your main reason for producing them will be to insert them into a Word document, a PowerPoint presentation or perhaps even an Excel file.

For each of these instances, the steps are as follows once the image is scanned and saved.

1. Open the application of your choice. (Word, Excel, PowerPoint, etc.)
2. From the menu items, select **Insert**, **Picture**.
3. The window opens for you to show the computer where the scanned image is stored on your computer and you select the appropriate location and file name.

Adjusting an Image Once it is Scanned

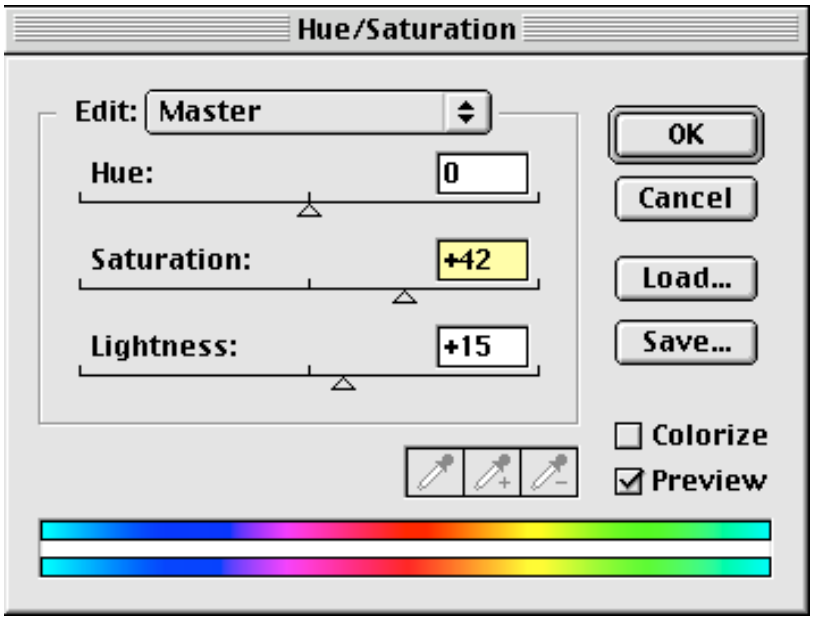
If your image did not come out as expected the first time you scanned it, this section will help you with the more common adjustments used here at NIEHS.

Image has a Pink or Purple Hue

This occurs because many glossy photos tend to reflect the light from the scanner back through the glass and this causes a change in the hue as the image as it is captured. To correct this, select **Image**, **Adjust**, **Auto Levels** from the PhotoShop menu items.

If it is still not quite the right color, or if it makes it worse, choose **Edit**, **Undo**.

Next try **Image**, **Adjust**, **Hue/Saturation** and move the triangle on the slides until it best matches your true image colors:

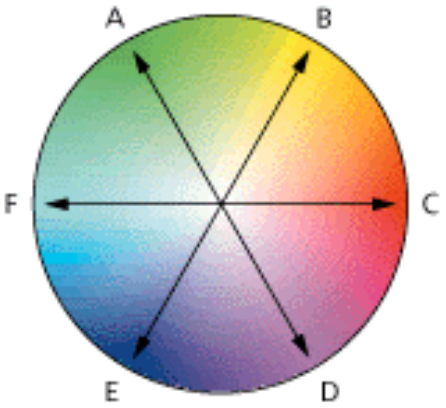


The Hue/Saturation command lets you adjust the hue, saturation, and lightness of individual color components in an image. Like the Color Balance command, this command relies on the color wheel. Adjusting the hue, or color, represents a move around the color wheel. Adjusting the saturation, or purity of the color, represents a move across its radius.

Image Color is Wrong

Every color adjustment affects the overall color balance in your image. You have numerous ways to achieve similar effects, so determining which adjustment is appropriate depends on the image and on the desired effect.

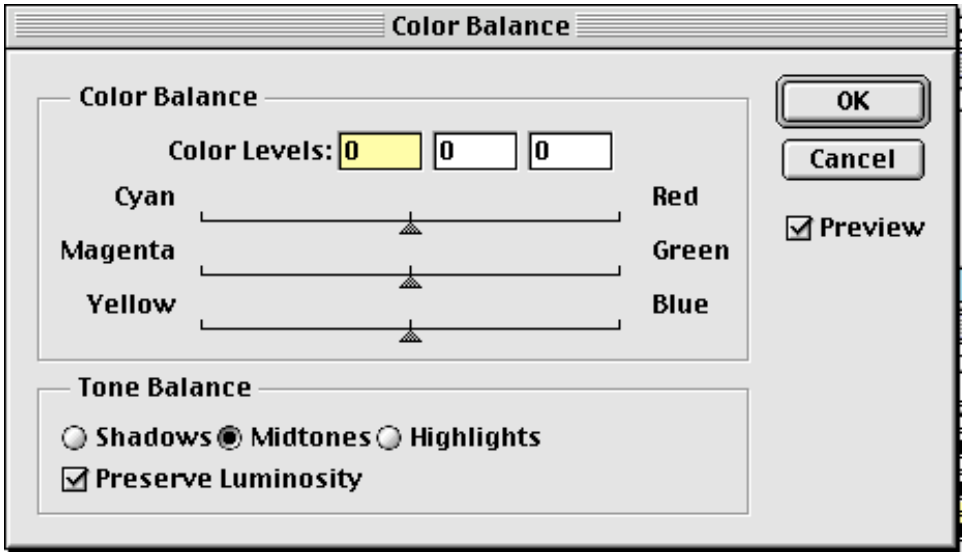
It helps to keep a diagram of the color wheel on hand if you're new to adjusting color components. You can use the color wheel to predict how a change in one color component affects other colors and also how changes translate between RGB and CMYK color models. For example, you can decrease the amount of any color in an image by increasing the amount of its opposite on the color wheel—and vice versa. Similarly, you can increase and decrease a color by adjusting the two adjacent colors on the wheel, or even by adjusting the two colors adjacent to its opposite.



A. Green **B.** Yellow **C.** Red **D.** Magenta **E.** Blue **F.** Cyan

For example, in a CMYK image you can decrease magenta either by decreasing the amount of magenta or its proportion (by adding cyan and yellow). You can even combine these two corrections, minimizing their effect on overall lightness. In an RGB image, you can decrease magenta by removing red and blue or by adding green. All of these adjustments result in an overall color balance containing less magenta.

To correct this, select **Image**, **Adjust**, **Color Balance** from the PhotoShop menu items.



Adjust the triangles left or right to add or subtract colors until they match your needs. Note that you can work with Shadows, Midtones and Highlights separately until you have the perfect color balance in your image.

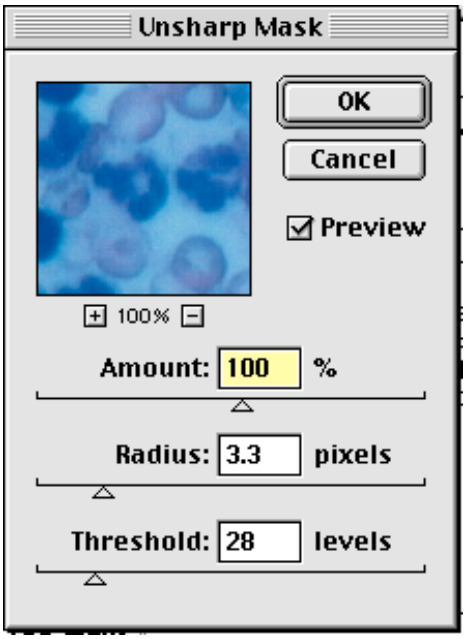
NOTE: You can adjust the individual shades of these six color leves in three areas of your image: Shadows, Midtones and Highlights. Different combinations of this 6 x 3 grid will work for different images. Not every adjustment works exactly the same on every similar image--you eyes cannot see the slight differences between them that Photoshop can.

Image is Fuzzy or Out of Focus

Focus blurry images by increasing the contrast of adjacent pixels. They include the Sharpen Edges and Unsharp Mask filters, which find and sharpen areas where significant color changes occur (such as at the edges). The **Unsharp Mask** filter is commonly used for high-end color correction.

This is more difficult to correct, and it may just be easier to create another original than to adjust it in PhotoShop.

To correct this, select **Filter**, **Sharpen**, **Unsharp Mask** from the PhotoShop menu items. (Note that the Sharpen choice DOES NOT sharpen the image as you would expect it to.)



Pull the triangles to the left or right until the previewed image in the box are acceptable for your purposes.

- For Amount, drag the slider or enter a value to determine how much to increase the contrast of pixels. For high-resolution printed images, an amount between 150% and 200% is recommended.

- For Radius, drag the slider or enter a value to determine the number of pixels surrounding the edge pixels that affects the sharpening. For high-resolution images, a Radius between 1 and 2 is recommended.

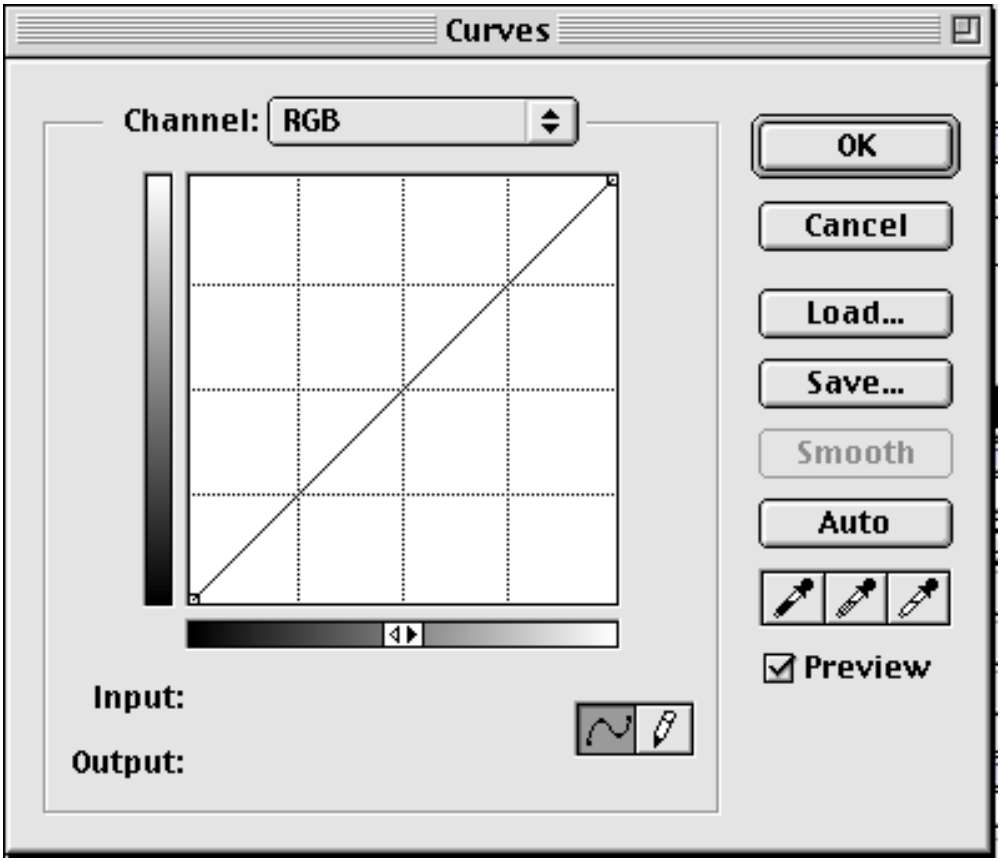
  A lower value sharpens only the edge pixels, whereas a higher value sharpens a wider band of pixels. This effect is much less noticeable in print than on-screen, because a 2-pixel radius represents a smaller area in a high-resolution printed image.

- For Threshold, drag the slider or enter a value to determine how different the sharpened pixels must be from the surrounding area before they are considered edge pixels and sharpened by the filter. To avoid introducing noise (in images with fleshtones, for example), experiment with Threshold values between 2 and 20. The default Threshold value (0) sharpens all pixels in the image.

Image is Too Dark or Too Light

From time to time the image scans darker or lighter or the original is too dark or too light for your needs. To correct this, select **Image**, **Adjust**, **Curves** from the PhotoShop menu items.

When the window opens up, click hold and drag the diagonal line at the near the top and pull it towards the left to lighten the image. If you want to darken the image, pull the line near the bottom towards the right. Do only small adjustments until you get the quality you prefer.



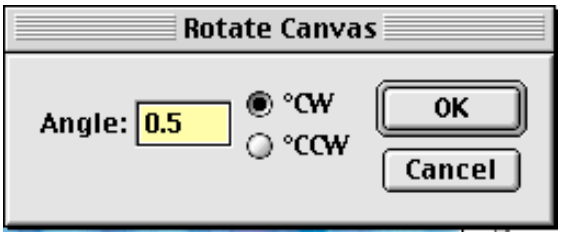
If the image needs only the blue to be darkened, for example, you can also use this window to change the Red, Green and Blue channels to lighter or darker without affecting the other two colors. To do this, select the appropriate channel at the top and adjust the line top left for lighter, bottom right for darker.

Image is Crooked

Occasionally you get a scanned image that wasn't straight on the original or gets bumped crooked as you close the cover on the scanner.

To correct this, select **Image**, **Rotate Canvas 90° CW**, **90° CCW** or **180°** if you image is off by these nice neat amounts. OR

To correct this, select **Image**, **Rotate Canvas**, **Arbitrary** from the PhotoShop menu items. Estimate how much of a turn you would like to make (in degrees) and select Clockwise or Counter-Clockwise from the radio buttons and then click on **OK**.



There is a slight to a long delay as the image is rotated, depending upon the size of the image and the dpi it was scanned at originally. This takes a bit of practice to get used to the changes on the screen and the number of degrees you are rotating, so please be patient with this process.

Definitions of all Rotate Canvas commands:

- 180° to rotate the image by a half-turn.
- 90° CW to rotate the image clockwise by a quarter-turn.
- 90° CCW to rotate the image counterclockwise by a quarter-turn.
- Arbitrary to rotate the image by the angle you specify. If you choose this option, enter an angle between -359.99 and 359.99 in the angle text box, then select CW or CWW to rotate clockwise or counterclockwise. Click OK.
- Flip Horizontal to flip the image horizontally, along the vertical axis.
- Flip Vertical to flip the image vertically, along the horizontal axis.

Only Portions of the Image are Needed

This is a bit trickier to do. First, choose **File**, **Save As** and give this file a slightly different name. (Always keep your original/scanned file without changes in case a mistake is made or other changes need to be make later.

First you need to erase the sections of the document that you do not need. Select the **eraser** tool and the appropriate brush type and erase the portions you do not want on your final image.

Next, select the **marquee** tool and click, hold and drag so that the section of the image that you need to move are highlighted with the dotted box. You could use the lasso tool just below the marquee tool if you had an odd-shaped piece that you would like to move

To move the highlighted section, click on the **move** tool and then click hold and drag the highlighted selection to its new location. Highlight all sections that you would like to keep and then use the **Image**, **Crop** selection to cut away empty space around the adjusted image.

NOTE: If you ever need to move this piece independently again, DO NOT use this procedure, but do a **copy** or **cut**, **paste** and then use the layers until all pieces are in place.

Save your file as PhotoShop document (.psd) Then do an **Image**, **Flatten Image** so that you are able to **Save As** in more common file types with a different name. It is better to have too many files than not enough in the older versions of the image.

Layers and Image Parts into a Whole

These are very specific shortcuts to do a quick job of editing images into a single picture. This is useful if you would like to place to gell lanes that are not contiguous next to each other for comparison.

1. Open the largest image and do an **Edit**, **Select All**.
2. Choose **Edit, Copy**.
3. Choose **File**, **New**. Photoshop understands what size of a piece you have in the copy clipboard and will give you the correct measurements for the piece you've just copied so just click on **OK**.
4. Go back to your original image and choose **Select**, **Deselect** (PC CTRL + D or Mac CMD + D) to release the marquee. Now use the **Marquee** selection tool to choose the piece that you would like to use on your new blank canvas. 
5. Choose **Edit, Copy**.
6. Switch back to your new blank canvas.
7. Choose **Edit, Paste**.
8. Change tools to the **Move** tool 
9. Move the layer you have just pasted to a location that is acceptable to you.
10. Go back to your original image and choose the next piece that you would like to use and choose **Edit, Copy**.
11. Switch back to your second blank canvas and choose **Edit, Paste**.
12. Move the layer you have just pasted to a location that is acceptable to you. Switch back to the **Marquee** selection tool and crop (**Image**, **Crop**) if necessary to remove extra space on the canvas.
13. Save the file as a Photoshop document (.psd) file.
14. Choose **Layer**, **Flatten Image**.
15. Choose **File**, **Save As** and select the appropriate file type needed for the software you will be using the image in.

Touching up Images

At times there are spots on your image and you would like to remove them. If they are very small, zoom in by using the keyboard quick keys:

PC		Mac	
Zoom In	**Zoom Out**	**Zoom In**	**Zoom Out**
CTRL + **+**	CTRL + **-**	Apple CMD + **+**	Apple CMD + **-**

You will need to fill in these small speck in with bits of color to match the background:

1. Select the **Eyedropper** tool.
2. Click on a sample color that you would like the spot **to be**. This samples the color and keeps it in the **Foreground** color palette on the toolbar.
3. Switch to the **Paintbrush** or **Pencil** tool and be sure to check the bush size on the right hand size brushes palette!
4. Click once on the spot. This does take some practice at aiming the tool and choosing the right color and right brush size.

You may need to fill in larger areas in with bits of color to match the background:

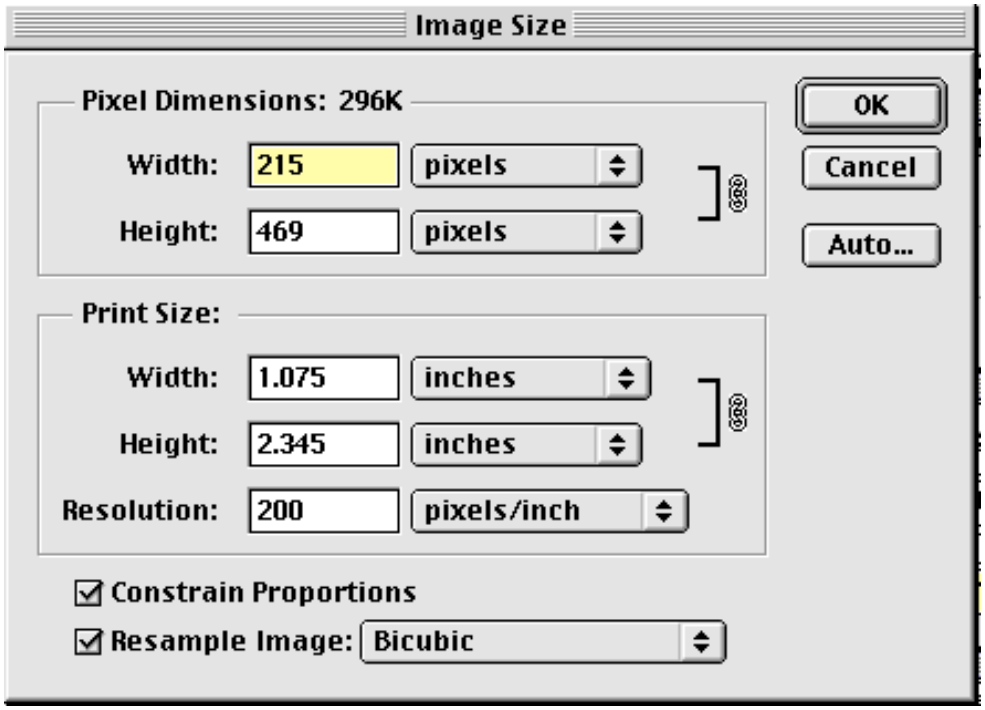
1. Select the **Eyedropper** tool.
2. Click on a sample color that you would like the spot **to be**.
3. Select the **Magic Wand** tool.
4. Click in the middle of the wrong colored area. This will select all contiguous like colors. If it does not work because of color gradients, then use the **Lasso** tool to draw a selection area.
5. Select the **Paint Bucket** tool
6. Click your mouse in the discolored area that has been select and this will “pour” the paint in.

The **Eraser** tool can be used to erase things from a white background. Be sure to check you brush size before you begin!

Saving and File Types

Note the file size of the .psd image you have just created in the previous exercise. These exercises will allow you to experiment with shedding file size and changing the size of the image as well as the resolution of the image.

Note the size of the file by choosing **Image**, **Image size**.



If you have scanned the image at a higher resolution than is necessary, change the **Resolution** choice to the appropriate size as determined by the software and final product of your image (see page 6).

Choose **File**, **Save As** and save the file with a slightly different name. Note the difference in the file size in the example with the resolution changed to 100:

Open the original .psd image again. If you forgot to scan the image at a higher percentage and need a larger picture than the 1.075 x 2.345 inch image used in this example, change the **Width** to 3 inches. Choose **File**, **Save As** and save the file with a slightly different name.

test.psd	620 K
test3.psd	4.5 MB

Note the **exponential** increase in the file size. This is why it is so important to determine the size of the image needed before you scan and adjust the 100% setting accordingly.

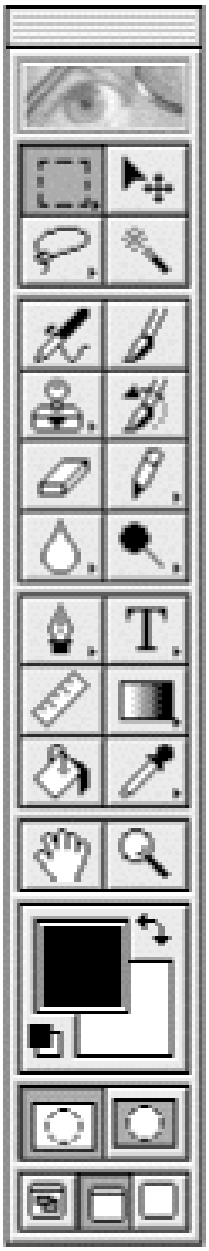
Open the original .psd image again. This time we will try to shed file size by adjusting the image type and taking advantage of some image compressions in various image types.

1. Open the original .psd image again.
2. Choose **Layer**, **Flatten Image**.
3. Choose **File**, **Save As** and save the file with a slightly different name and change the Image Type at the bottom of the Save As window to .**jpg** (use high resolution)
4. Open the original .psd image again.
5. Choose **Layer**, **Flatten Image**.
6. Choose **File**, **Save As** and save the file with a slightly different name and change the Image Type at the bottom of the Save As window to **.pict** (click OK)
7. Open the original .psd image again.
8. Choose **Layer**, **Flatten Image**.
9. Choose **File**, **Save As** and save the file with a slightly different name and change the Image Type at the bottom of the Save As window to **.tiff** (use IBM PC)
10. Open the original .psd image again.
11. Choose **Layer**, **Flatten Image**.
12. Choose **File**, **Save As** and save the file with a slightly different name and change the Image Type at the bottom of the Save As window to **.eps**
13. Compare the file sizes for each of these formats:

test.eps	440 K
test.jpg	84 K
test.pct	308 K
test.psd	620 K
test.tif	280 K

Appendix A

PhotoShop Extras



Marquee selection Move

Lasso selection tool Magic Wand

Airbrush Paintbrush

Rubber Stamp Airbrush History

Eraser Pencil

Blur Dodge

Pen Text

Measure Line Gradient

Paint Bucket Eye Dropper

Hand Zoom

Foreground/Background Colors

Edit Standard Edit Quick Mask

Standard Screen Mode Full Screen Menu Full Screen

Toolbar shortcuts

- + click tool or + press shortcut key to cycle through hidden tools except
- Double-click tool or select tool and press Return to display Options palette.
- Ctrl + click to display context-sensitive menu.
- Press to constrain dragging or drawing to straight line or multiples of 45º.
- Press Caps Lock to use precise cross hair for brushes.
- Press Return or Enter to apply an operation of a magnetic tool, or press Esc or CMD or CTRL + . to cancel the operation.

Changing colors of a portion of a picture:

1. Select an item that will be changed (you can use the Marquee select too, the Magic Wand selection tool or the Lasso selection tool to do this).

2. Click once on the foreground color box at the bottom on the toolbar palette. This will open up the color scale. Slide the small triangles on the thin color bar up or down to get the shade of your choice and then click once on the color you prefer on the color screen on the left of that window.

3. Change to the Fill Bucket tool and then move your mouse over the item you have highlighted on your picture and click to "pour" the color into the selected portion.

OR

1. Select Image, Adjust, Color Balance from the PhotoShop menu items.

2. Pull the color scale slides to add/subtrat shades of colors as needed.

Greyscale Scanning

Greyscale scanning is most often used for original photographs, but can also be effective for maintaining the soft edge of some pencil sketches that use lots of shading. Most flatbed desktop scanners are capable of scanning 256 shades of grey. Some 30- and 36-bit scanners tout 4096 shades of grey. While this may be true, you probably won't be able to use them. The current PostScript specification only allows for 254 halftone steps (the way a shade of grey is represented in print, 254 steps with pure white and pure black which makes 256 total). The extra grey shades (bit depth) may help to improve the scanners optical density (OD) range if implemented properly. This can give you better shadow detail. Unfortunately most moderately priced 30- and 36-bit desktop scanners implement the the expanded bit depth only in color, opting for a more common lookup table (LUT) approach to greyscale scanning.

Nevertheless, 256 shades of grey will probably be sufficient for just about all your needs (unless you plan to scan Tomographs, or high-density negatives). Few desktop printers can do justice to even 100 shades of grey. Even Ansel Adams landscapes were judged good enough at 256 shades to be sold as screen savers.

Principles of Greyscale Scanning

Most of us scan at too high a resolution. As we increase scan resolution, we capture too much detail--and the scan file can balloon to outrageous size. The PostScript imagesetter, desktop laserprinter, or other device must render all of the data, using lots of costly RIP time [RIP - Raster Image Processor, the specialized computer in your laserprinter or more expensive imagesetters].

In addition, as you work with a scanned image, the computer constantly has to re-crunch the scan data. Over the course of a project this time really adds up. As we count on computer's CPU to do more and more of the work for screen presentation or ink jet printer output we can slow our system to a crawl by using too much data.

Scans with too much data not only rob your time, they can even crash the RIP or lock-up your computer.

Take a few moments to calculate what you need rather than scanning at a high DPI just to be on the safe side. Capture just enough detail for what you need to do.

Production Tips (Greyscale Scanning)

Do a little arithmetic before you scan. Planning to reduce the image to 50%? This doubles the resolution. Reducing to 33% triples the resolution, and so on.

For greyscale, a final resolution of 1.5 times the LPI works well in most cases. For soft subjects you can get away with 1.3 times the LPI. (i.e. - Linotronic output at 1200 dpi, 133 lpi your scan resolution should be no greater than 200 dpi). Final scan resolution means that you've calculated the change in spatial resolution when you size your original scan, as discussed in the above tip) So the formula is:

DPI = LPI x %increase or decrease of original x 1.5

Avoid Data Overkill!

Clean up scans in a retouching program before using them. Adjust their size and resolution before placing them in a layout program.

Crop the image in a package like PhotoShop as close as possible to avoid having the software from computing all that white space. Avoid using PageMaker or other layout programs ability to crop a scan; this feature merely masks an area and does not decrease the data that the software must compute.

Sharpening the image in a retouching program gives a better looking result than using a high scan resolution. Make the on-screen image just a little sharper than you think is needed--it softens a bit in production. The CCD chip in your scanner that actually reads the greyscale data is linearily balanced, meaning that the transitions between grey areas tend to be minimized. Sharpening algorithms in a retouching program like PhotoShop can adjust for this. Always run your program's Sharpen routine on a scanned photo to compensate for this.

Another little known tip is to add noise to a scan to minimize the transitional steps between your grey scales. This is a technique often employed by illstrators and four-color shops for smoothing a low resolution scan. For instance if you have created a blend in your illustration package that has only thirty steps, you can export the EPS file into your favorite image editor and add one or two units of random noise with the noise filter to take away hard edges and cheat your eye. This technique works well for ultra-high and very low resolution scans too that either exceed the grey level of your imagesetter or produce very pixelated images. Simply add a little noise to the image and you "fool" the eye.

Color Scanning Formula (Contone)

Just as color scanning is more complex than simple greyscale scanning, so to is the formula for computing the proper original scan resolution for continuous tone devices. Clearly the best possible situation would be pixel for pixel when printing to a continuous tone device, but in reality there are a lot of other factors that come into play when determining the optimum scanning resolution.

Those factors are:

The quality of the output device as determined by its propensity to generate a hard dot. (A hard dot referrs to the devices output dot spread (dot gain) or blooming characteristics. Even though a device is rated at 600dpi or 8000 line resolution, the actual resolvability varies because of a number of opto-mechanical factors).

The characteristics of the original to be scanned. Soft originals--those with compact dynamic range, little fine detail, no hard edges, and sharp contrast changes--can usually be scanned at lower than 1:1 ratio resolution and acheive quality results.

The viewing characteristics of the original. Originals viewed from a significant distance 1:1 ratio resolution becomes less critical than originals designed to be viewed at close distance or under direct scrutiny.

Color Scanning

Continuous tone images are used in lots of "consumer quality" color output. Consumer Quality color output would include desktop color printers, slide recorders, on-screen presentations, and even web graphics. When dealing with these applications it does become cost effective, reasonable, and very practical to use color scanning systems to build files for output to these devices and media.

A continous-tone device is a non-screened system that is capable of applying the entire gamut of its colors to the smallest picture element that it can reproduce. In effect, this means that the device is capable of making any spot on its output any color you wish. This is radically different from a traditional four-color process where color is simulated by creating color rosettes with four different halftone screens. No longer are elaborate screen angles and separation schemes being computed by both the computer and the printer, the printer merely prints pixel-for-pixel the exact color specified on that dot.

As simple as this sounds, however, it creates one major problem for the desktop scanning system, computer, and color printer--FILE SIZE.

In a traditional halftone device (a non-FM system) very seldom are all the output dots represented, in fact, most of the time there is lots of space between the dots. Lots of space translates to no data, and therefore the image files and the output files can be relatively small and efficient compared to a continous-tone or contone device. In a contone device all the output dots have to have data, even if that data is white (or blank).

In a perfect situation, you would like to have one scan spot for each output dot that you would be using, this way you have a 1:1 ratio between spatial and actual resolution. In a halftone device this is no problem, since even a lowly 300dpi scanner can produce enough dots to satisfy the halftone device and its missing dots. But satisfying a contone device is much more difficult.

Information on File Compression:

The TIFF format provides a Compressed TIFF version -- that is usually recognized anytime that Uncompressed TIFF is. Other formats can be manually compressed -- but will need to

be manually uncompressed anytime you need them. Manual compression is used more for archiving the file for storage and can save a significant amount of space.

Without loosing any of the data, most forms of compression are based on For inthe LZH (Lempel-Zimpel-Huffman) algorithm, they are:

For the Mac: **Stuffit, CompactPro**

For the PC: **PKZip, ARJ, LHA**

For UNIX Machines; **Unix Compress, gzip**

They are all good and most will compress a file within 5-10% of the other.

Beginner's Guide for web page link on home.htm
http://www.cnet.com/Content/Reports/Special/Beginner/index.html

Compare the following example:

Scan a 5" x 7" color original to produce an 150% enlargement on 8 1/2" x 11" paper on a 133 lpi halftone device and a 400 x 400 dpi continous tone device.

The scan file size for the halftone device would only need to be about 300 dpi or approximately 9 megabytes uncompressed.

The scan file size for the continuous tone device would need to be 600 dpi or approximately 37 megabytes, over four times as large!

Thankfully, most applications of continuous tone are at screen resolution (i.e.- PowerPoint Presentation, or Web Art) where the output resolutions are less than 100 dpi. Additionally, the ubiquitous Color Ink Jet printer is actually a halftone device masquerateing as a contone device so we have to deal with them a little different as well.

Extras:

http://www.currents.net/resources/dictionary/emoticons.html Emoticons

http://www.currents.net/resources/dictionary/filetypes.html File abbreviations

http://www.freestuffcenter.com/awesome/ free clip art

http://www.cis.ohio-state.edu/hypertext/faq/usenet/jpeg-faq/part1/faq.html

http://www.scantips.com/faq.html

http://desktoppublishing.com/graphicsites.html

Keep in mind that any graphic files you import from the WEB will look BITMAPPED in your final output due to the low resolution of web images. Web graphics are designed to look good on your monitor and are NOT OPTIMIZED for output to higher resolution devices such as film recorders.

Q. Why are my image files so large? How can I make them smaller?

A. There is no really good answer for this one. Quality images require pixels and pixels make the file size large... However, scanning at the appropriate resolution for the job's purpose (instead of always using the maximum possible resolution) is the very best possible answer.

For documents, Xerox Pagis Pro 2.0 and its XIF files are a very good choice. LineArt images are 1/8 the size of GrayScale and 1/24 the size of color. Photo images are very poor in LineArt mode however. And you may sometimes want to use GrayScale instead of LineArt on web pages, because at 75 to 100 dpi, the aliasing of GrayScale helps minimize jaggies.

For graphics (logos, etc), using GIF files with limited colors (like 16 colors) is the smallest file. Graphics normally use very few colors.

For photographs, GIF format allows only 256 colors and so is not desirable. JPG files are very small, wonderful for web or email purposes, but JPG compression causes quality losses that are not appropriate for your one archived master copy. Check the Basics - Part 9 section about file types and compression.

Easy Measuring

Written by Deke McClelland Macworld

To measure the angle of crooked scans and photos in Photoshop, you'd typically set the line tool to a weight of 0 and then draw an invisible line, noting its angle in the Info palette. Depending on the direction of your drag, you might need to subtract 180 degrees or invert the value to straighten the image. But now Photoshop 5's measure tool does those calculations for you. After drawing a measure line and dragging its endpoints to adjust it, choose Numeric from the Transform submenu. The angle appears in the Rotate option box, automatically converted to its complimentary value between 45 and -45 degrees.

"101"

Switching back and forth between RGB and CMYK isn't recommended

ZDTips: Inside Photoshop

Multiple conversions can degrade your image file, since Photoshop rounds off the color values each time it makes a conversion. The best way to work is in RGB mode until you've finished making all your adjustments to the image, then convert to CMYK. If you're using Photoshop 5 and you need to see what your image will look like in CMYK, go to the View menu and choose Preview>CMYK.

Painting patterns

ZDTips: Inside Photoshop

Photoshop has a great way to easily paint in borders and other repetitive patterns. First, create the pattern or element of the picture you want to repeat, or define an existing pattern. Select it, then choose Define Brush in the Brushes palette Options pop-up menu. Deselect the pattern, then use the Brush tool to paint your pattern into the image.

Importing Illustrator files

ZDTips: Inside Photoshop

The best way to bring an Illustrator file into Photoshop isn't by cutting and pasting. Use the Place command in the File menu instead. Your vector art is placed in its own layer, maintaining its original aspect ratio, and in a Transform bounding box for easy scaling, rotating, etc.

How to move the mouse in a perfectly straight line

ZDTips: Inside Photoshop

You can constrain to a straight line with painting, drawing, or erasing tools by holding down the [shift] key while dragging.

Appendix B

Adding Printer Choices

Adding Printers on a PC

If you would like to take advantage of the public color and dye sublimation printers, you will need to make those choices available to your computer. The following steps will guide you through the process. If you are uneasy with setting this up yourself, please contact your Computer Support Personnel for assistance.

NOTE: Your computer will continue to print to the new printer choice until you have changed it. Please remember to switch back to your default printer when you finish using the public color or dye sublimation printers.

This means if you print color transparencies to one of the public color or dye sublimation printers and then switch to email and try to print an email message (without changing your printer choice back), it will be printed to the much more expensive color and dye sublimation printer instead. This can be very embarrassing and waste a lot of supplies before you realize that there is nothing wrong with your own printer—but that you have not changed it back.

To save you from making this common mistake, place a sticky note on your monitor when you leave your office to go to the public printers to pick up your printouts. This will remind you to switch your printer back to your own before you do your next print job.

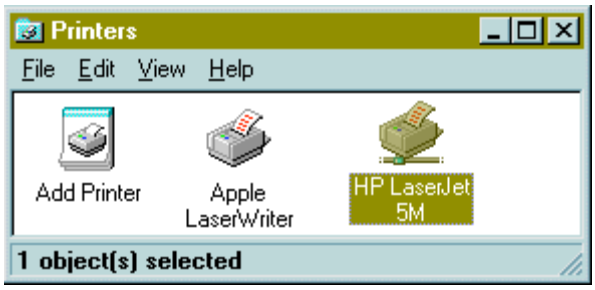
A. Opening the Printers Window

Note: You will have to ask your Computer Support Person to install the correct printer driver for the public color and dye sublimation printers if you plan on using either of them.

To begin with you must know the Zone that the printer is in (city-named printers are in the zone matching the first letter of their names). Most PC printers are found under:

Network Neighborhood/NIEHS/HETI/

The **Printers** window can be opened up several different ways, as follows:



Choice Number One:

14. Open up the **My Computer** window by double clicking with the left mouse button on the **My Computer** icon. Within that window will be a **Printers** folder.

- Double click with the left mouse button on that folder to open up the **Printers** window.

Choice Number Two:

Click once with the left mouse button on the **Start** button in the **Taskbar**. Move your cursor up to the **Settings** item in the menu, then across to the **Printers** item in the cascading menu. This will open up the **Printers** window.

Choice Number Three:

1. Click once with the left mouse button on the **Start** button in the **Taskbar**. Move your cursor up to the **Settings** item in the menu, then across to the **Control Panel** item in the cascading menu.

5. Locate the **Printers** icon in the **Control Panel** widow and double click on it with the left mouse button, this will open up the **Printers** window.

Now that the **Printers** window is open you should see at least one printer that has been set up for you to print to. At this point you can do a couple of things.

Adding a Printer on a PC

At times you may want to add a new printer to your **Printers** window. You may need to be able to print to the Public color printer, or you may need to print to a co-worker's printer.

1. To add a new printer, simply double click with the left mouse button on the **Add Printer** icon. This will launch the **Add Printer Wizard** that will assist you in setting up a new printer for your computer to print to.

7. The **Add Printer Wizard** will first tell you that you are about to add new printer to your **Printers** window. If you wish to continue, click on the **Next** button; if not click on the **Cancel** button.

h. The next Wizard window will ask how the printer is attached to your computer. A **Local** printer is one that is directly connected to your computer via a printer cable. A **Network** printer is a printer accessible via the network communication line.

i. If you select **Local**, you will be given a list of manufacturers and models of printers to choose from. Select one and click on the **Next** button.

If you selected the **Network** option, you will be asked to enter the network path or queue name. If you know this information, enter it; otherwise you will have to browse the network to locate the printer you wish to connect to. This works exactly the same way **Network Neighborhood** does.

a. After you have selected either a **Local** or **Network** printer, you will be asked which port to attach the printer to. Almost always a **Local** printer will be connected to the **LPT1 port** since that is where the printer cable connects the computer to the printer. A Network printer would be best attached to **LPT2** or **LPT3** to keep from interfering with any Local printers attached to LPT1. Then click on the **Next** button.

b. The next window will ask for a **printer name** and will offer a default name but feel free to change it to describe where the print job will printed.

   Also this screen offers the opportunity to select this printer as your "**default**" printer. If you do so, all your print jobs will go here by default until you change it to another default. Click on the **Next** button.

c. The next screen offers the opportunity to print a test page. Normally this is not necessary, but if you wish to test the connection, this is the best place to do it. It will ask you to confirm if the page has been printed properly. If so, click on the **Next** button; if not, click on the **Help** button to get assistance as to why the print job was not successful.

MS Windows **will not** copy the software drivers for your printer either directly from your computer or from the computer that is sharing the printer. You must either have your Computer Support Person complete this step if your computer does not have that printer driver, or you must do it yourself. After the drivers have been copied, your new printer connection should be established and available for selection to print from within any Windows based application.

Adding Printers on a Macintosh

If you would like to take advantage of the public color and dye sublimation printers, you will need to make those choices available to your computer. The following steps will guide you through the process. If you are uneasy with setting this up yourself, please contact your Computer Support Personnel for assistance.

NOTE: Your computer will continue to print to the new printer choice until you have changed it. Please remember to switch back to your default printer when you finish using the public color or dye sublimation printers.

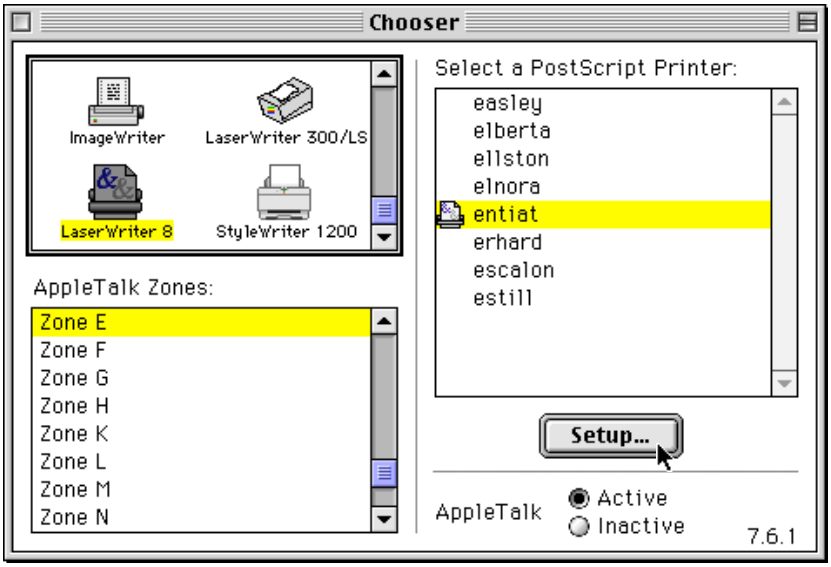
This means if you print color transparencies to one of the public color or dye sublimation printers and then switch to email and try to print an email message (without changing your printer choice back), it will be printed to the much more expensive color and dye sublimation printer instead. This can be very embarrassing and waste a lot of supplies before you realize that there is nothing wrong with your own printer—but that you have not changed it back.

To save you from making this common mistake, place a sticky note on your monitor when you leave your office to go to the public printers to pick up your printouts. This will remind you to switch your printer back to your own before you do your next print job.

A. Building a Desktop Printer

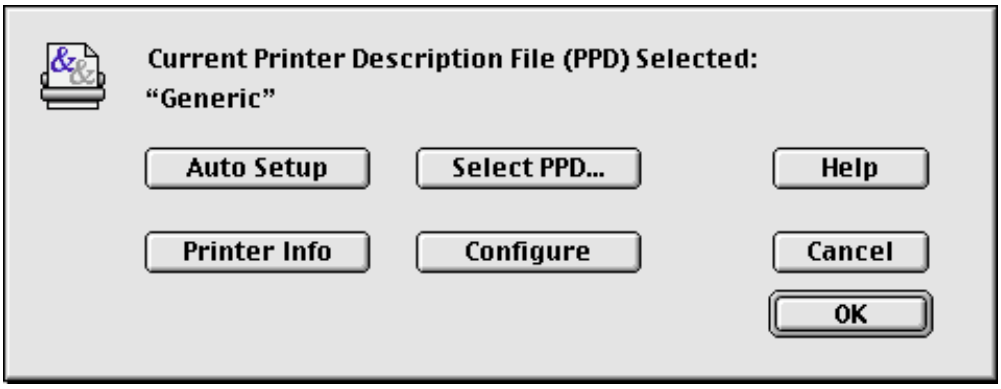
Note: You will have to ask your Computer Support Person to install the correct printer driver for the public color and dye sublimation printers if you plan on using either of them.

- To begin with you must know the Zone that the printer is in (city-named printers are in the zone matching the first letter of their names).
- From the Apple Menu items, select Chooser.
- Click on the correct printer driver icon in the top, left portion of the Chooser window. The Laser Writer 8 driver is normally used for black and white printers. The public dye sublimation printer use the Seiko printer driver.
- Click on the appropriate Zone or section name in the bottom, left portion of the Chooser window for where the new destination printer is located.
- Click on the correct printer name/designation that you would like to print to.



- Click on **Setup**.

- When the next window opens, click on **Autosetup** and then **OK**.



- The process is complete, close the Chooser window.

Appendix C

Graphics Terms and Definitions

scanner - An input device that reads images or text and converts the data into digital signals. Graphical scanners read photos or other images into the computer and digitize them, producing bitmapped graphics files. Text scanners use optical character recognition software to read pages of text and produce editable text files. Bar code scanners, as used in stores, convert bar codes into digital information. Some types of scanners are flatbed scanners, sheet-fed scanners, hand-held scanners, and slide scanners.

resolution - The high number of dots per square inch required to produce a high-quality image in printing or on a computer display screen. The higher the resolution, the finer the image quality. Good laser or inkjet printers and scanners provide a resolution of 600 dots per inch; high-quality typesetting machines can print at 2,540 dpi. A low number of dots or lines per inch result in low-resolution images and use less memory but result in a lower print or display quality.

pixel - Short for picture element. A pixel is the smallest logical unit of visual information that can be used to build an image. Pixels are the little squares that can be seen when a graphics image is enlarged. The more pixels in an image, the better its resolution.

dpi - Dots per inch. A measure of the resolution of printers, scanners and monitors. The more dots per inch, the higher the resolution: 600 dpi would mean 600 x 600 = 360,000 dots per square inch.

lpi - Lines Per Inch. A measurement of the resolution of a halftone screen, or of the number of lines a printer prints on a page in each vertical inch.

ppi - Pixels per inch. A measurement used in bitmap graphics.

SPSI - Spots per square inch. A measurement of resolution of graphics. The more spots per inch, the higher the resolution.

color depth - In bitmap graphics, the number of bits per pixel, which determines the number of shades of gray or variations of color that can be displayed by a computer monitor. For example, a monitor with 16-bit color can display 65,536 different colors; a monitor with 24-bit color can display 16,777,216 colors. Multimedia programs and games may require a minimum of 256 colors; 32-bit color does not add more colors, but gives the display additional masking and channeling abilities.

line drawing - A drawing made by solid lines outlining a figure. Line drawings are the simplest images in computer graphics, as they require only black and white (or one color and white).

grayscale - Composed of a series of shades of gray. Gray-scale images have much more detail than line drawings (which are only white and black), and require much more storage space. High-resolution scanners can differentiate up to 256 different shades of gray.

RGB - Red, Green, Blue. The three primary colors of light which, mixed together in various proportions, produce all the other colors. In a color cathode ray tube three electron guns direct these three colors of light at the screen in separate beams.

CMYK - Cyan Magenta Yellow black. The four standard inks for printing. Four-color printing requires color separations for each of these standard inks.

graphics - The creation, editing, and printing of pictures. Computer graphics have two main methods: vector graphics (stored as a list of vectors) and raster or bitmap graphics (stored as a collection of dots or pixels).

vector graphics - A way of representing pictures by designating coordinates and drawing lines or geometric shapes in relation to them. Vector graphics are different from raster graphics, in which an image is stored as a collection of pixels. In vector graphics, the image is saved as a file containing instructions for drawing it. One advantage of vector graphics over raster graphics is that a picture can be enlarged or reduced without losing quality.

Another difference is that in vector graphics, the elements of a picture (circles, squares, etc.) remain independent objects which can be edited and moved around, whereas in raster graphics, once the elements are drawn they become part of the overall pattern of pixels. A vector graphics image also requires less memory than a raster graphics image, which requires a specific memory location for each pixel.

raster graphics - Bitmapped graphics; computer graphics in which the image is made up of tiny dots, called pixels.

.BMP - Bitmap. An image or other collection of data represented as an array of bits. In bitmap graphics, an image is displayed on the screen as a collection of tiny squares called pixels, which together form a pattern. Each pixel in the image corresponds with one or more bits; the number of bits per pixel determines how many shades of gray or colors can be displayed. "Bitmap" is used to refer to both the image itself and the file that holds the data for the image.

A way of displaying images on a computer screen in which each picture is represented as an array of little squares called pixels. Each pixel is stored in a specific location in memory, and corresponds to one or more bits. The number of bits per pixel determines the number of colors or shades of gray that can be displayed. Bitmapped graphics can be created and edited in paint programs or photo editing programs, and can be stored in a number of file formats.

Depending on file format, bitmapped graphics can sometimes be imported into word processing, page layout, or spreadsheet programs, or incorporated in World Wide Web pages.
Definition for: bitmap

.PICT - This kind of file stores images in QuickDraw vector format. PICT2 can have grayscale bitmapped images also.

.EPS - Encapsulated PostScript format. A graphics file format that can be used with many different computers and printers. EPS files can be imported into most desktop publishing software.

.GIF - Graphics Interchange Format. A graphics file format developed by CompuServe that uses LZW compression and 256 colors. GIF files are widely used on World Wide Web pages because they provide good-quality color images in a format that takes up a small amount of space. The GIF89 version allows one color of an image to be made transparent.

.JPEG - Joint Photographic Experts Group. A format for storing high-quality color and grayscale photographs in bitmap form; also the group that developed the format. JPEG provides lossy compression by segmenting the picture into small blocks which are divided

to get the desired ratio; the process is reversed to decompress the image .JPEG uses the JPEG File Interchange Format, or JFIF.

.TIFF - Tagged Image File Format. A bitmap graphics file format that was developed by Aldus and Microsoft for storing scanned images. It can be used with black and white, grayscale, 8-bit color, and 24-bit color images, and transfers well between different platforms. TIFF images can be compressed using LZW compression or other compression formats.

compression - The temporary coding of data in a way that saves storage space or transmission time. Most text files can be compressed to about half their normal size. Graphics can be compressed to 10 percent of their original size.

lossy compression - A compression technique in which a file can be highly compacted, but some data is lost. Large files such as graphics, video, or audio files can be stored in a smaller amount of space than with lossless compression, but some loss of quality will result when the file is decompressed. Examples of lossy compression algorithms are JPEG and MPEG.

lossless compression - Compression methods in which no data is lost. With lossless compression, a large file can be compressed to take up less space, and then decompressed without any loss of information. In the case of graphics or video files, the quality of the original image will be preserved. An example of a lossless compression algorithm is gzip.

LZW compression - Lempel-Ziv Welch compression. A compression algorithm designed by Terry Welch based on the LZ77 and LZ78 compression techniques developed by Jacob Ziv and Abraham Lempel. LZW compression is used for both archiving and transmitting files.

Three fundamental characteristics of color in Photoshop:

Hue is the color reflected from or transmitted through an object. It is measured as a location on the standard color wheel, expressed as a degree between 0 and 360. In common use, hue is identified by the name of the color such as red, orange, or green.

Saturation, sometimes called chroma, is the strength or purity of the color. Saturation represents the amount of gray in proportion to the hue, measured as a percentage from 0% (gray) to 100% (fully saturated). On the standard color wheel, saturation increases from the center to the edge.

Brightness is the relative lightness or darkness of the color, usually measured as a percentage from 0% (black) to 100% (white).